EFFECT OF SOME PRUNING TREATMENTS ON GROWTH AND YIELD OF SOME GRAPE CULTIVARS: [A] Bud load and cane length of Crimson Seedless grapevines

El-Mogy, M. M.

ABSTRACT

In 2002 and 2003 seasons, mature vines of Crimson seedless grapevines were pruned at the dormant season to leave 60, 90 and 120 buds per vine through changing the cane length to be 5, 10 and 15 buds/cane.

Increasing vine load from 60 to 120 buds was accompanied with increase prunings weight, yield/vine, number of clusters per vine, total acidity %, total carbohydrates in canes and reduction in the shoot length, leaf area, cluster weight, berry weight, berry size, berry dimension, berry firmness and berry adherence strength. Also, the high bud load caused decrease of total soluble solids%, as well as, TSS/acid ratio and total anthocyanin. All the studied parameters except yield and total acidity were tended to increase with raising vine load and the cane length.

The highest yield with good quality of Crimson grapevines was obtained with bud load 90 buds per vine and cane length (10-15 buds/cane).

INTRODUCTION


Therefore, the target of the present is determine the optimum number of buds per vine as well as the optimum length of canes which may result in a high yield with good quality of Crimson seedless grapevines.

MATERIALS AND METHODS

This work was carried out during two successive seasons (2002 and 2003) in a private vineyard at El-Mahla elkobra, Gharbia governorate on "Crimson" Seedless grapevines. The vines were five years old, grown in a loam soil under drip irrigation system.
El-Mogy, M. M.

Vines were spaced 2x3 meters, and they were cane trained and trellised according to the gable system. Vines were nearly uniform in vigour subjected to the same horticultural practices and cane pruned during the last week of January in both seasons.

Determination of the best bud load in Crimson vines:

Nine treatments were conducted to determine the best suitable bud load per vine. Different bud loads were experimented by verifying the length of the vine canes at winter pruning.

The experimented treatments were as follows:-

<table>
<thead>
<tr>
<th>Buds / Cane</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>5, 10, 15 buds / cane</td>
<td>60 buds / vine = (5, 10, 15 buds / cane)</td>
</tr>
<tr>
<td>5, 10, 15 buds / cane</td>
<td>90 buds / vine = (5, 10, 15 buds / cane)</td>
</tr>
<tr>
<td>5, 10, 15 buds / cane</td>
<td>120 buds / vine = (5, 10, 15 buds / cane)</td>
</tr>
</tbody>
</table>

The treatments were designed in a complete randomized block design with three replicates, each had three vines (3x3).

The measurements:

1- Vegetative growth:

At growth season's end, the ultimate shoot length (cm), shoot base diameter (cm), leaf area (cm²) of the apical 5th and 6th leaves using an areameter, weight of pruning woods/vine (Kg) at the winter pruning were recorded and wood ripening coefficient in the winter were calculated using the following equation (Bouard, 1966).

\[
\text{wood ripening coefficient} = \frac{\text{Length of mature part (cm)}}{\text{Total shoot length (cm)}}
\]

2- Yield / vine and yield structure:

Number of clusters/vine and average yield/vine (Kg) were determined at harvest time of the two studied seasons. Yield was harvested, when TSS % of berry juice reached 18% in the treatment of the highest bud load + the greatest cane length according to Tourky et al. (1995).

Representative random samples of 12 clusters / treatment (4 clusters from each replicate) were collected at the harvest time, and brought to the laboratory for determining average cluster weight (g), No. of berries/cluster and fruit characteristics (physically and chemically).

3- Physical and Chemical characteristics of berries (fruit quality):

Weight of 100 berries (g), volume of 100 berries (cm³), berry dimensions (mm), berry firmness and adherence strength (g/cm³). Total soluble solids (TSS%) in berry juice using a hand refractometer, Total titratable acidity (as tartaric acid%) (A.O.A.C, 1985), TSS/acid ratio and total anthocyanin of the berry skin (g/100g fresh weight) according to Husia et al., (1965) were recorded.

4- Cane content of total carbohydrates:

Three canes/vine were collected at winter pruning for determining total carbohydrates (g/100g dry weight) using the phenol sulphoric acid method described by Smith et al., (1956).

5- Statistically analysis:

The statistical analysis of the present data was carried out according to the methods described by Snedecor and Cochran (1980). Treatment means
RESULTS AND DISCUSSION

1- Vegetative growth:

Data in Table (1) clearly showed that increasing bud load/vine and cane length decreased shoot length and leaf area but increased pruning weight. The minimum values of shoot length and leaf area were detected at load 120 buds/vine with 15 buds/cane. Pruning the vines to leave 60 buds/vine with 5 buds/cane gave the highest shoot length and leaf area. The vice versa in relation to weight of pruning. These results were true in 2002 and 2003 seasons.

The reduction on shoot length and leaf area in response to high bud load might be attributed to the large number of grown shoots/vine as a result to high bud load/vine, which led also to the promotion of pruning weight. The competition among the large number of grown shoots for water and minerals weight be responsible for the reduction of shoot length and leaf area. The present results are in agreement with those obtained by Possingham (1994), Abd El-wahab et al. (1997), Gobara (1999), Moretti, et al., (2002), Dami et al., (2003) and Terry and Rick (2003) who found that increasing bud load/vine decreased shoot length and leaf area of various grape cultivars.

As shown in Table (1) and Figure (1), it was obvious that coefficient of wood ripening was negatively influenced by the increase in bud load/vine (60 – 120), as well as cane length (5 - 15 buds/cane). The decrease in wood ripening was significant only in treatment 120 buds with 15 buds/cane. Data recorded in this respect was (0.76 and 0.71) for the two seasons 2002 and 2003, respectively. These results are in line with those obtained by Fawzi et al., (1984); Marwad et al., (1993); Rizk et al., (1994); Rizk, (1996) and Ali et al., (2000), who found that increasing bud load/vine decreased coefficient of wood ripening of various grape cultivars.

2- Yield/vine and yield structure:

It is clearly from the obtained data in Table (2) that increasing number of buds per vine and cane length were followed by a gradual promotion of yield expressed as weight and number of clusters per vine. The effect of different vine load levels on yield/vine was in some cases insignificant. The best results with regard to yield were obtained from vines pruned to 120 buds/vine with 15 buds of the cane length. The severe pruning (60 buds/vine) and the lowest of the buds/cane (5 buds/cane) gave the minimum yield (9.33 kg/vine in 2002 and 10.43 kg/vine in 2003). Also, it can be seen from the data in table (2) that light pruning (120 buds/vine) with cane length (15 buds/cane) gave the highest yield (11.67 kg/vine in 2002 and 13.15 kg/vine in 2003). These results were true in both seasons.

The yield/vine was proportional to raising fruiting buds and number of clusters per vine as the number of buds remaining on the vines was increased.
Figure (1): Effect of bud load and cane length on the coefficient of wood ripening at both seasons, 2002-2004
Table (1): Effect of bud load and cane length on growth of Crimson Seedless grapevines in seasons 2002 and 2003

<table>
<thead>
<tr>
<th>Shoot length (cm)</th>
<th>Leaf area (cm²)</th>
<th>Weight of wood pruning (Kg)</th>
<th>Wood ripening coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>204.30</td>
<td>a</td>
<td>211.60</td>
<td>a</td>
</tr>
<tr>
<td>184.80</td>
<td>bc</td>
<td>199.20</td>
<td>bc</td>
</tr>
<tr>
<td>164.40</td>
<td>de</td>
<td>173.90</td>
<td>bcd</td>
</tr>
<tr>
<td>159.70</td>
<td>b</td>
<td>166.30</td>
<td>b</td>
</tr>
<tr>
<td>172.70</td>
<td>cd</td>
<td>175.60</td>
<td>cde</td>
</tr>
<tr>
<td>155.70</td>
<td>ef</td>
<td>161.70</td>
<td>de</td>
</tr>
<tr>
<td>175.80</td>
<td>cd</td>
<td>174.60</td>
<td>de</td>
</tr>
<tr>
<td>163.30</td>
<td>de</td>
<td>168.40</td>
<td>e</td>
</tr>
<tr>
<td>147.60</td>
<td>f</td>
<td>154.40</td>
<td>e</td>
</tr>
</tbody>
</table>

Mean having the latter in the same column do not significantly differ using Duncan multiple range test at 5% level of probability

Table (2): Effect of bud load and cane length on yield and physical characteristics of cluster on Crimson Seedless grapevines in seasons 2002 and 2003

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Yield / vine (Kg)</th>
<th>No. of clusters/vine</th>
<th>Cluster Weight (gm)</th>
<th>No. of berries/cluster</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bud load</td>
<td>Cane length</td>
<td>Yield / vine (Kg)</td>
<td>No. of clusters/vine</td>
<td>Cluster Weight (gm)</td>
</tr>
<tr>
<td>60</td>
<td>5 buds</td>
<td>9.33</td>
<td>c</td>
<td>10.43</td>
</tr>
<tr>
<td></td>
<td>10 buds</td>
<td>10.22</td>
<td>c</td>
<td>10.45</td>
</tr>
<tr>
<td></td>
<td>15 buds</td>
<td>10.29</td>
<td>c</td>
<td>10.60</td>
</tr>
<tr>
<td>90</td>
<td>5 buds</td>
<td>10.34</td>
<td>c</td>
<td>12.31</td>
</tr>
<tr>
<td></td>
<td>10 buds</td>
<td>10.42</td>
<td>bc</td>
<td>12.87</td>
</tr>
<tr>
<td></td>
<td>15 buds</td>
<td>10.48</td>
<td>bc</td>
<td>12.95</td>
</tr>
<tr>
<td>120</td>
<td>5 buds</td>
<td>10.49</td>
<td>abc</td>
<td>13.08</td>
</tr>
<tr>
<td></td>
<td>10 buds</td>
<td>11.60</td>
<td>ab</td>
<td>13.14</td>
</tr>
<tr>
<td></td>
<td>15 buds</td>
<td>11.67</td>
<td>a</td>
<td>13.15</td>
</tr>
</tbody>
</table>

Mean having the latter in the same column do not significantly differ using Duncan multiple range test at 5% level of probability.

Data in table (2) obviously show that the tested pruning treatments had apparent effect on cluster weight. Cluster weight was progressively raised with reducing the number of remaining buds/vine and cane length. Differences between those treatments were statistically significant in most cases. Severe pruning with leaving cane length 60 buds/vine (on 5 buds/cane) was responsible for producing the heaviest clusters (309.3 and 320.9 g in both seasons 2002 & 2003, respectively). The lowest cluster weight were borne on vines, which had 120 buds/vine on 15 buds/cane (220.1 and 218.4 g in both seasons respectively). These results could be ascribed to the increase in number of clusters per vine.

No significant differences between all treatments were obtained in relation to the number of berries.


3- Physical and Chemical characteristics of berries (fruit quality):

It is clear from data in table (3) that varying bud load/vine and cane length significantly affected physical characteristics of the berries such as, berry weight, size, dimensions, firmness and adherence strength. However, those parameters were negatively influenced by the increase in bud load/vine (90 - 120) as well as cane length (10 - 15 buds/cane).

Regarding to chemical characteristics of berries, it was obviously from results in table (4). Increasing number of buds/vine and cane length was followed by a decrease of total soluble solids%, as well as TSS/acid ratio and total anthocyanine.


As a conclusion, the best results with regard to yield and quality of the berries of Crimson grapevines were obtained as a result of pruning the vines leaving 90 buds/vine with cane length (10 - 15 buds/cane).
Table (3) : Effect of bud load and cane length on physical characteristics of berries on Crimson Seedless grapevines in seasons 2002 and 2003

<table>
<thead>
<tr>
<th>Treatments</th>
<th>TSS (%)</th>
<th>Acidity (%)</th>
<th>TSS/acid ratio</th>
<th>Total anthocyanin (%)</th>
<th>Total carbohydrates (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>5 buds</td>
<td>20.93</td>
<td>21.20</td>
<td>0.42</td>
<td>0.41</td>
</tr>
<tr>
<td>10 buds</td>
<td>21.33</td>
<td>22.27</td>
<td>0.57</td>
<td>0.47</td>
<td>37.42</td>
</tr>
<tr>
<td>15 buds</td>
<td>21.73</td>
<td>23.27</td>
<td>0.60</td>
<td>0.48</td>
<td>36.22</td>
</tr>
<tr>
<td>90</td>
<td>5 buds</td>
<td>21.80</td>
<td>20.87</td>
<td>0.46</td>
<td>0.50</td>
</tr>
<tr>
<td>10 buds</td>
<td>21.33</td>
<td>20.47</td>
<td>0.56</td>
<td>0.55</td>
<td>38.09</td>
</tr>
<tr>
<td>15 buds</td>
<td>20.13</td>
<td>19.20</td>
<td>0.57</td>
<td>0.60</td>
<td>35.32</td>
</tr>
<tr>
<td>120</td>
<td>5 buds</td>
<td>19.87</td>
<td>19.67</td>
<td>0.50</td>
<td>0.62</td>
</tr>
<tr>
<td>10 buds</td>
<td>18.60</td>
<td>18.53</td>
<td>0.56</td>
<td>0.66</td>
<td>33.57</td>
</tr>
<tr>
<td>15 buds</td>
<td>18.47</td>
<td>18.00</td>
<td>0.61</td>
<td>0.67</td>
<td>30.28</td>
</tr>
</tbody>
</table>

Mean having the latter in the same column do not significantly differ using Duncan multiple range test at 5% level of probability.
4- Total carbohydrates contents of the cane:

Results in Table (4) further revealed that increasing bud load/vine and cane length, was followed by a gradual promotion on percentage of total carbohydrates. The maximum values of total carbohydrates were recorded for vines bearing 120 buds/vine with 15 buds/cane (25.82 & 25.64% in both seasons 2002 and 2003, respectively). On the contrary, the lowest carbohydrates content was found in vines that had 60 buds/vine its recorded (20.04% and 20.06% in both seasons 2002 and 2003 respectively). These results were true in both seasons.

The promotion of total carbohydrates in response to increasing bud load was mainly attributed to the effect of increasing vine size as a result of increasing the number of buds retained on the vine followed stimulation of carbohydrate synthesis.


REFERENCES


El-Mogy, M. M.


تأثير بعض معاملات التقليم على النمو والمحصول لبعض أصناف العنب
(4) حمولة البراعم وطول القصعة على كرمة عنب الكريمسون سيداس
محمود محمد الموجي
قسم بحوث الطب步行ه - مركز بحوث الزراعة جيزة مصر

خلال موسمي 2001-2002 تم تقييم كرمة عنب الكريمسون الناضجة في خلال مرحلة
السكون. حيث تم ترك على الكرمة 12 عين بطول قصعة 5-10 عين بالقصة
ال الواحدة. ظهرت زيادة حمولة الكرمة من 120 عين بمستوى بزيادة وزن خشب التقليم
والمحصول وعدد الفاكهة في الكرمة، والسعة المنوية للعندميات والخصوبة الكلبية للكرمة، والخصوبة المنوية
للكرامة في الكرمة، بينما أدى إلى تقليل طول الفرع ومساحة الفروع، وزن الفاكهة وزن وحجم
100 حبة، وعمرها وصلابة وقوة نشاف الحبة، والسعة المنوية لمواد القصمة أنابيب الكرامة، ويمكن أن
نحمل نتيجة الدراسة إلى أن أفضل حمل للبراعم بكرمة هو 90 عين للكرمة الواحدة في صفوف
الكريمسون أي نترك قصاصات بطول 10 عين للقصة في ذلك نوصي لنا أعلى محصول نشر بأفضل
جودة.